TRANSPORTATION Revolution 5 Mississippi Valley Conference

4-Lane to 3-Lane Conversions

Troy A. Jerman, P.E.
Senior Transportation Engineer
Office of Traffic and Safety
Iowa Department of Transportation
troy.jerman@dot.iowa.gov

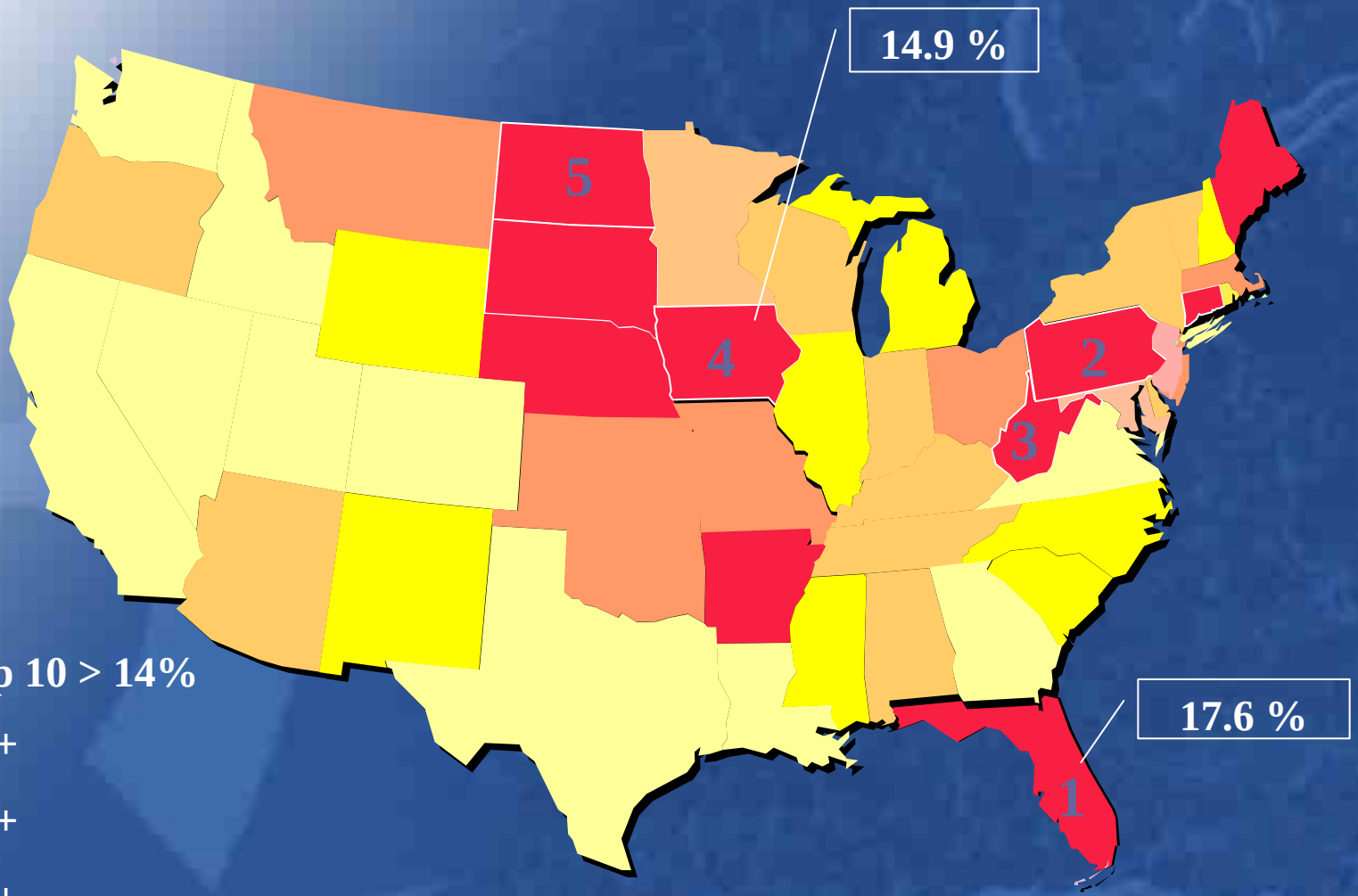
TRANSPORTATION Revolution

5 Mississippi Valley Conference

The Iowa 4 Lane to 3 Lane Experience

Optimization of Pavement to Improve Safety and Enhance Quality of Life

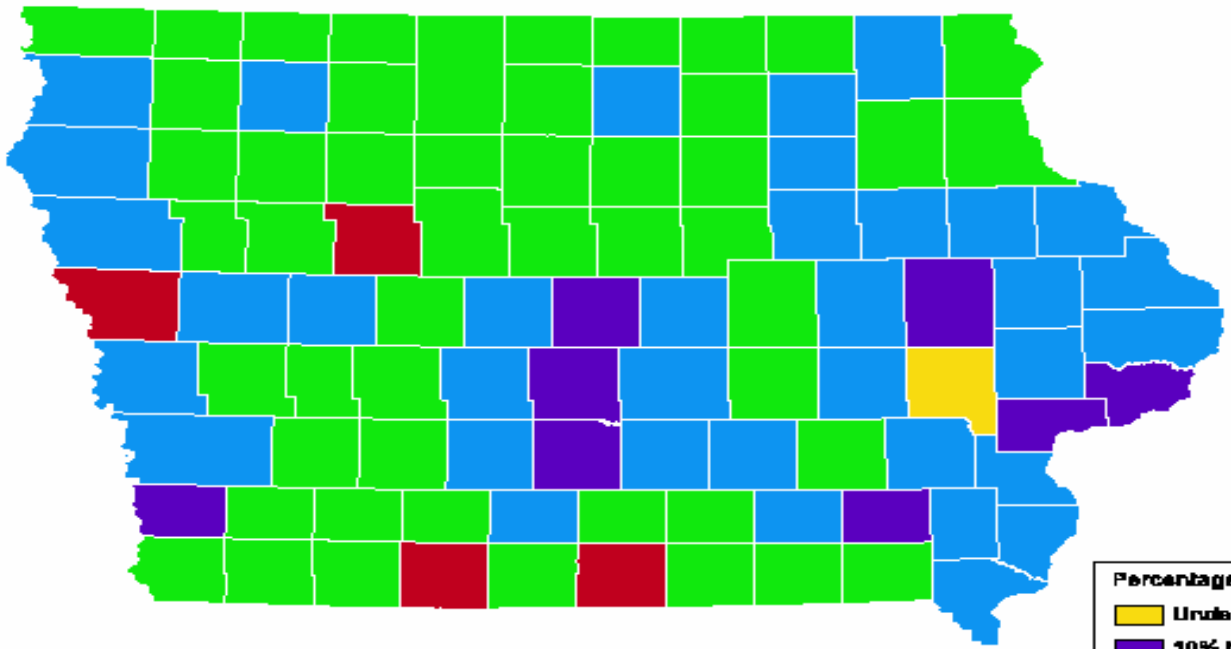
Percentage of Population Age 65 and Older



- Top 10 > 14%
- 13+
- 12+
- 11+
- <11 including Utah 8.5% Alaska 5.7%

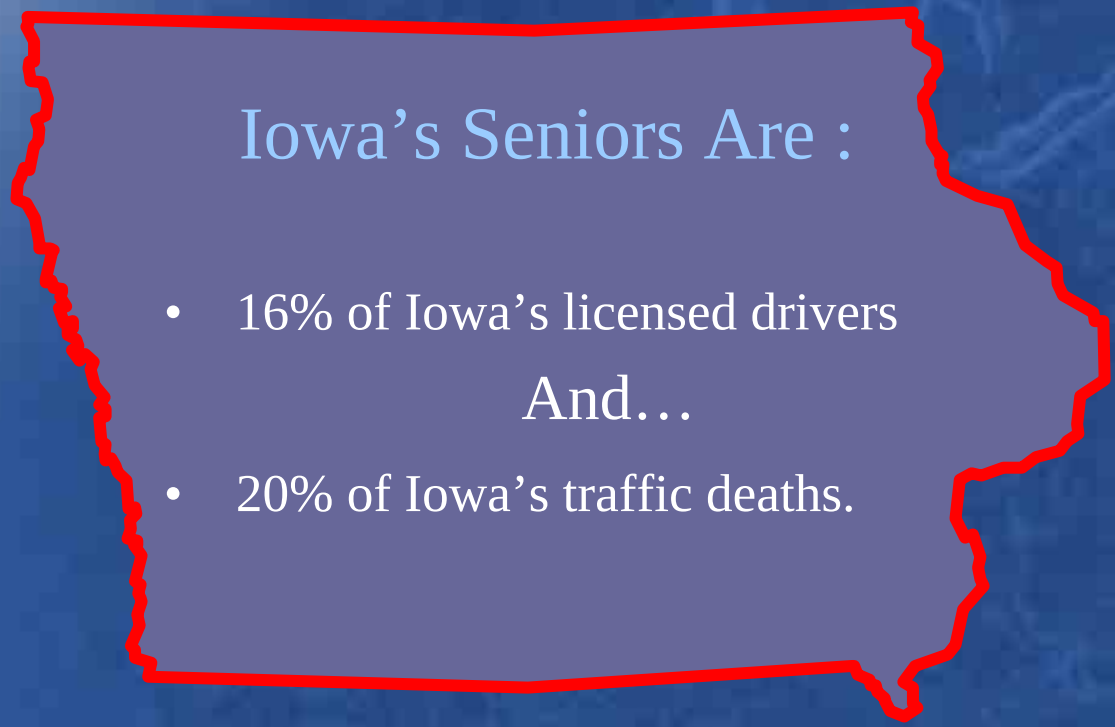
Percent of Iowa Drivers 65 & Older by County

2001



- In some Iowa counties, more than ¼ of all drivers are already age 65 or older
- In 53 Iowa counties, persons 65 or older represent 20% or more of the licensed drivers.

Iowa Older Driver Highway Fatalities



Traditional Improvement to 2-Lane Urban Street

4-Lane Undivided Roadway

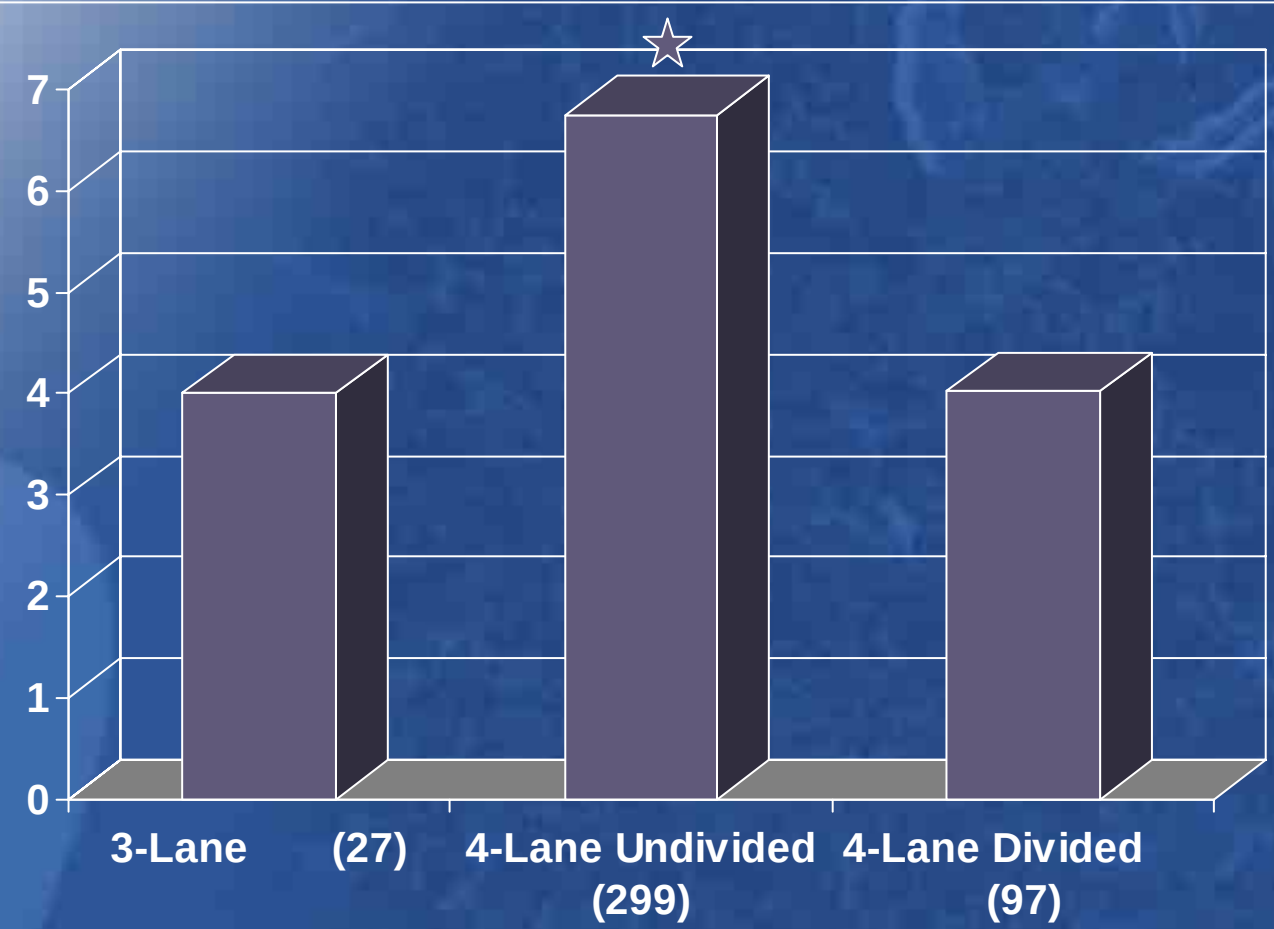
US-61 Ft. Madison, Iowa
Two-Lane to Four-Lane Widening

Corridor Element	Change
+ Traffic volume	Increased 4 percent
+ Corridor travel delay	Increased 4 percent
+ Mid-block 85th %tile speed	Increased 2.5 percent
+ Traffic traveling more than 5 mph over the posted speed limit	Increased from 0.5 percent to 4.2 percent
+ Crash rate	Increased 14 percent
+ Injury rate	Increased 88 percent
+ Total value loss	Increased 280 percent

Urban Minnesota DOT Crash Rates

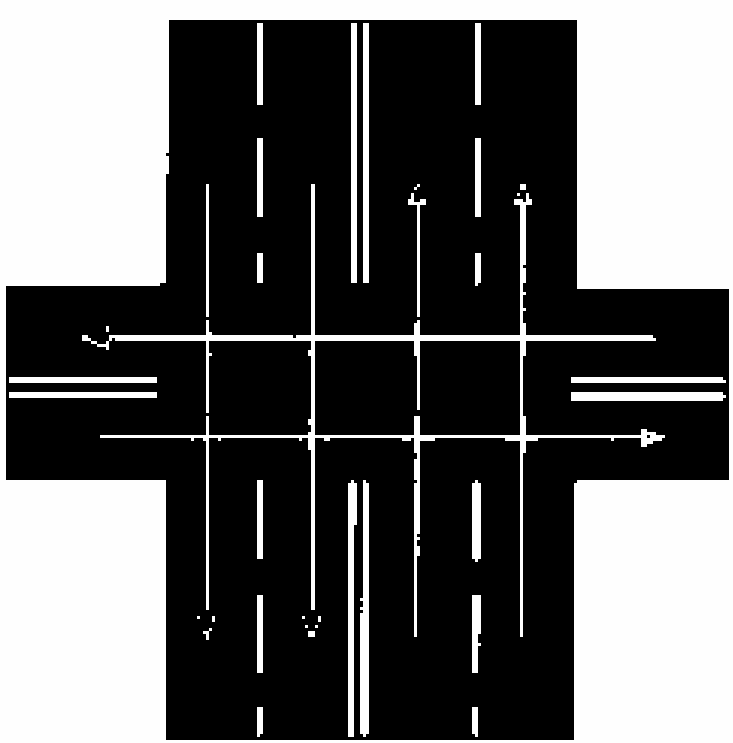
Crash Rate

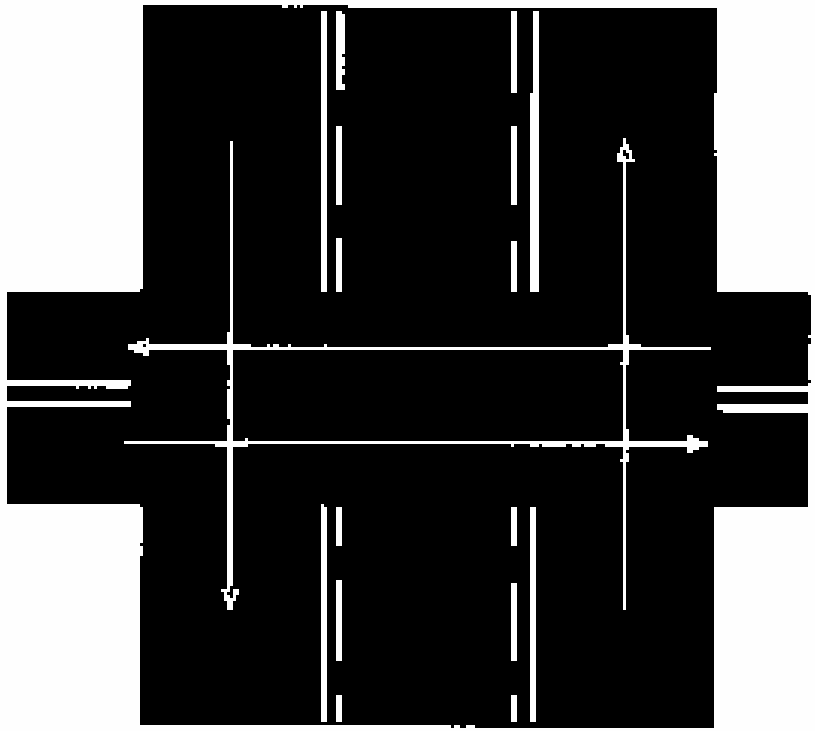
(Crashes / Million Vehicle Miles Traveled)



☆ ***After converting several high crash 4-Lane corridors***

Cross-Traffic Conflict Points



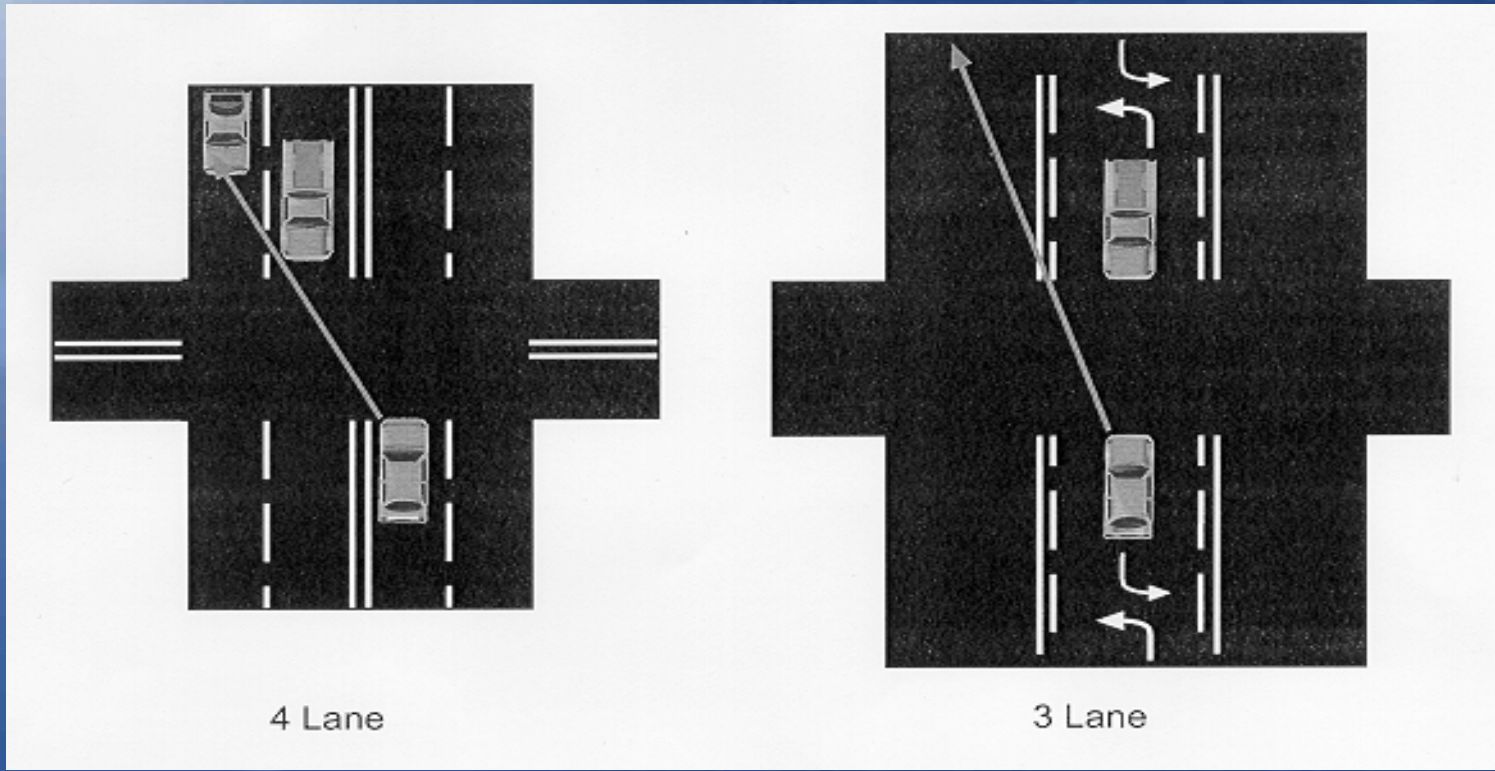


○ Conflict Points

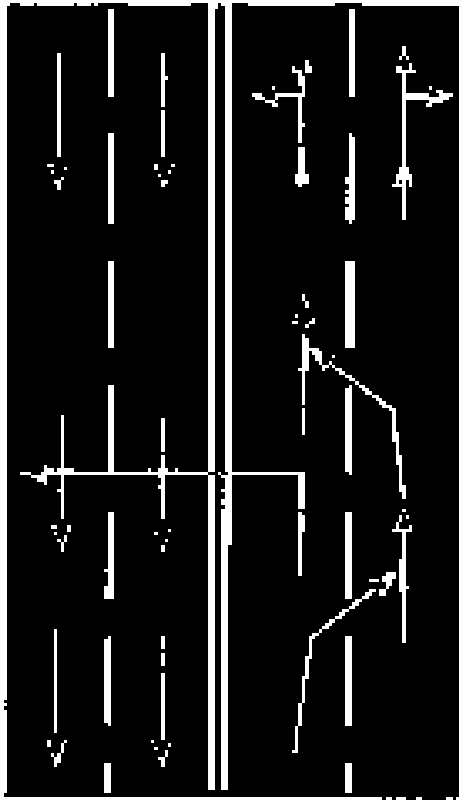
4 Lane

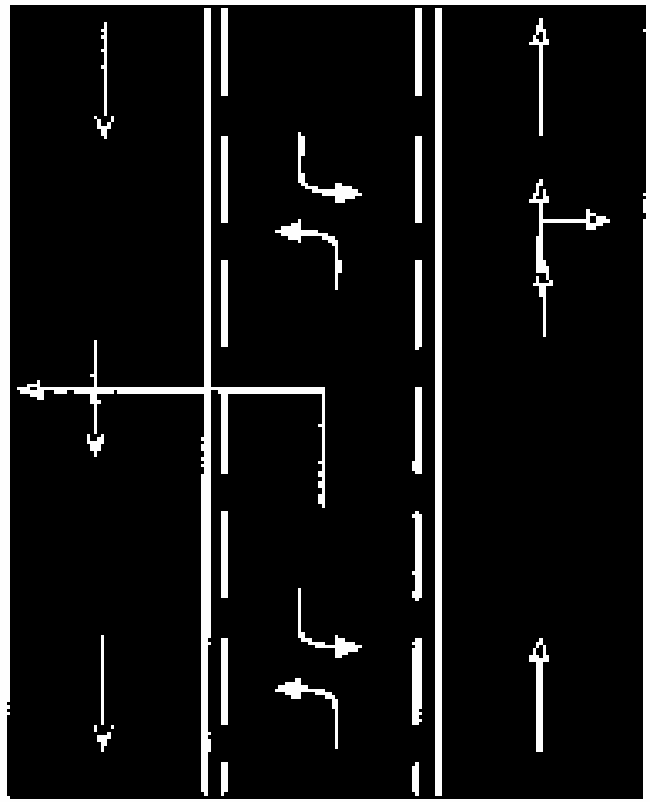
3 Lane

Intersection Site Distance



Mid-Block Conflict Points





○ Conflict Points

4 Lane

3 Lane

Pedestrian Crossing
4 Lane Undivided Roadway

Pedestrian Crossing
3 Lane Undivided

Responding to Older Driver / Pedestrian Concerns in Sioux Center, Iowa July 1999

Sioux Center Population 6,0002

US-75 Sioux Center
Before

US-75 Sioux Center
After

Iowa's First Case Study
US-75 Sioux Center

1998 ADT	8 -14,000 VPD
Percent Trucks	9%
Land Use	Residential / CBD w/parking
Traffic Signals	Three
Speed Limit	25 MPH

Before Concerns:

- Excessive speeding
- Difficulty entering and crossing US-75
- Fatal and major injury older person pedestrian crashes

Arterial LOS

US Highway 75 Corridor from 1st Street to N. 4th Street

Cross Section	Total Corridor Travel Delay	Average Travel Speed	LOS
Four lane undivided	20.5 secs	16.0 mph	C
Three lane alternative	29.4 secs	14.3 mph	C
Five lane alternative	15.8 secs	17.1 mph	C

Four-Lane Undivided Roadway/Intersection Operating as “Defacto” Three-Lane Cross Section

Sioux Center After

Before / After Analysis
US-75 Sioux Center

	Before	After (2)	Difference
Peak Hour Travel Time	50 sec	68 sec	+ 36 %
Average Travel Speed 1	28 mph	21 mph	- 25%
Average Free Flow Speed 1	35 mph	32 mph	- 10%
Vehicles Traveling more than 5mph above speed limit 1	43 %	13 %	- 70 %
Crashes	30	13	- 57 %
Personal Injury Crashes	10	0	- 100 %

1. Posted Speed Limit – 25MPH
2. 7 months before and after

Before / After Public Opinion Survey(1) US-75 Sioux Center

	Before	After
Support Conversion	18 %	45%
Neutral	37 %	15%
Oppose Conversion	45 %	40%

(1) 930 Responses- City Population 6,002

Ardith Lein, Executive Director
Sioux Center Chamber of Commerce

Mrs. Lein stated that:

- *The Chamber of Commerce Executive Board, as well as almost all business owners, prefer the three-lane highway to the previous four-lane highway.*

Ardith Lein, Executive Director, SCCC (cont.)

- *It has slowed traffic down through the central business district, which has improved the shopping environment.*
- *Pedestrian crossing of US-75 are much safer; there have been fewer accidents and the emergency vehicles like having the center lane available to drive in.*
- *"**Safety has to be the priority** |over a little extra delay."*

Harold Schiebout, City Manager

- *"But we can not have it both ways so we have to decide which is best overall."*
- *"Currently, the city council supports keeping the conversion permanent."*

Resident, Rod DeKruyf

Rod DeKruyt, had called Mr. Schiebout and stated:

- *“I thought all of you were plumb nuts when you proposed changing US 75 from 4 lanes to 3 lanes.*
- *“But now I take my hat off to you for being persistent.”*
- *“It is not perfect, but it is much better.”*

Paul Adkins, Chief of Police

- *Chief Adkins admitted he was opposed to the four lane to three lane conversion when it was proposed.*
- *He said it was initially confusing for many elderly drivers, but now he is the biggest advocate.*
- *He suggested that any city that is considering a conversion to call him at (---) --- ----*

"Admit it, 21 East Works"

- "When Duluth officials announced they would convert busy 21st Avenue East between London Road and Woodland Avenue from four lanes to two, with a turn lane in the middle, some armchair analysts predicted it wouldn't work. (The News – Tribune Opinion page was among them.)
- Well, it works.
- About everyone agrees – from city traffic officials to neighbors – that the change has eased congestion and reduced drivers' speed making it safer for pedestrians, and it hasn't caused problems in winter."

Duluth News Tribune, Editorial, April 28, 1998

Des Moines Beaver Avenue
(13,000 ADT)

City Councilman, Chris Coleman:

Before:

"When they (staff) first told me about it I said it was the craziest thing I had ever heard of."

After:

"I am convinced it works. It lets the safest, most responsible drivers set the traffic flow instead of the fastest most aggressive."

Blue Grass - US 61 (9,000 ADT)

- Speeds regulated much better
- Accidents have decreased significantly
- Reduction in capacity is not an issue.

Sanford Remly, Public Works Director

Osceola - US 34 (11,000ADT)

- "I was skeptical but have since changed my mind."
- Initial reactions are positive
- Capacity has not been adversely affected
- Overall a success

Brad Wright, City Administrator

IOWA 4-LANE TO 3-LANE CONVERSION STUDY
SUMMARY OF STUDY RESULTS
BEFORE AND AFTER CONVERSION

		ANNUAL AVERAGE CRASHES			CRASH RATE (PER MVM)		
CITY	AADT(range)	BEFORE	AFTER	%CHANGE	BEFORE	AFTER	%CHANGE
Storm Lake	5100 - 9100	64	34	-47	13.40	8.18	-39
Clear Lake	11900 - 12000	34			5.42		
Mason City	7100	9	4	-56	1.67	0.87	-48
Osceola	6100 - 9900	47	22	-53	7.70	3.50	-55
Manchester	11200	15	11	-27	12.26	7.60	-38
Iowa Falls	9400 - 11700	21	8	-62	4.82		
Rock Rapids	3910 - 5100	6	2	-67	10.23	3.31	-68
Glenwood	2950 - 7100	30	15	-50	12.60	6.28	-50

"Before" cases based on 5 years of data (except Storm Lake); "after" cases based on 1 to 5 years of data. Year of conversion is not included in the data analysis. Storm Lake "before" data 1991 and 1992 only; conversion in 1993. Clear Lake conversion completed in 2003, after data not available. AADT reported for year of conversion where available. Storm Lake AADT not available for 1993; value shown represents first available year (1996). Council Bluffs AADT not available for 2000; value shown represents 1996.

IOWA 4-LANE TO 3-LANE CONVERSION STUDY
SUMMARY OF STUDY RESULTS
BEFORE AND AFTER CONVERSION

		ANNUAL AVERAGE CRASHES			CRASH RATE (PER MVM)		
CITY	AADT(range)	BEFORE	AFTER	%CHANGE	BEFORE	AFTER	%CHANGE
Des Moines	12300 - 17400	67	39	-42	11.13	6.57	-41
Council Bluffs	9600	8	2	-75	10.36	2.70	-74
Blue Grass	9400 - 10000	12	3	-75	6.23	2.86	-54
Sioux Center	7200 - 10500	65	23	-65	11.13	4.45	-60
Indianola	7500 - 12800	29	24	-17	4.85	3.18	-34
Lawton	8400 - 9800	6	2	-67	2.97	0.80	-73
Sioux City	9300 - 11100	5	3	-40	1.94	1.34	-31

"Before" cases based on 5 years of data (except Storm Lake); "after" cases based on 1 to 5 years of data. Year of conversion is not included in the data analysis. Storm Lake "before" data 1991 and 1992 only; conversion in 1993. Clear Lake conversion completed in 2003, after data not available. AADT reported for year of conversion where available. Storm Lake AADT not available for 1993; value shown represents first available year (1996). Council Bluffs AADT not available for 2000; value shown represents 1996.

2003 FHWA Safety Study

- 12 Conversion sites
  - In Washington and California
  - 8,000 – 16,500 ADT
- 25 Comparison sites
  - In Washington and California
  - 5,400 – 26,100 ADT

Findings:

1. Crash frequencies were 6% lower
2. Crash rates did not change significantly
3. Conversion did not affect crash severity

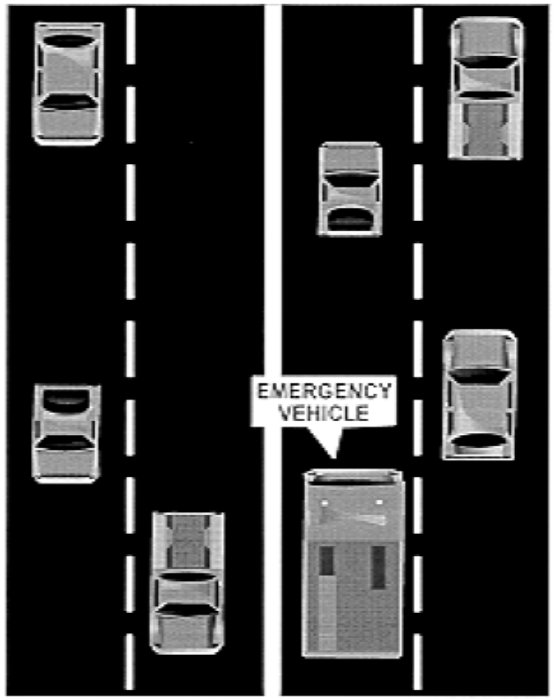
"Regression model used in the analysis as sample limitations precluded use of Empirical Bayes method."

Potential Benefits

- Improved Vehicle Safety
- Improved Pedestrian Safety
- Traffic Calming
- Improved Emergency Response Time
- Potential Bike Accommodation

Emergency Vehicle Access

Four - Lane Emergency Vehicle Access



Three - Lane Emergency Vehicle Access

Three-Lane Cross Section with Bike Lanes

Potential Disadvantages

1. Increased delay at un-signalized access points.

2. Loss of passing opportunities
   - Aggressive Drivers
   - Slow Moving Vehicles

3. Increased Travel Delay

TRANSPORTATION Revolution 5 Mississippi Valley Conference

Supplementary Right Turn Lanes

Access Control Considerations

Eliminate, consolidate and relocate driveways

Cautions

- ADT greater than 15,000ADT
- At grade rail crossings
- School bus stops
- Curbside mailboxes
- 90 degree turns along corridor
- High volume of slow-moving agricultural vehicles
- Offset side streets or major access points
- High volume turning trucks

Other Low-Cost Conversions

Normal 2-Lane Roadway to a Narrow 3-Lane Roadway.

Maquoketa-64

Converting 4-Lane Undivided to a narrow 3/5-Lane Roadway

10.5 – 10 – 9 – 9 – 10 – 10.5

Lane Widths

Which is the Priority?

- Improving traffic and pedestrian safety while maintaining acceptable traffic flow

Or

- Moving traffic with a minimum amount of delay and accepting higher safety risks

????

For Further Information or Response

www.ctre.iastate.edu/research/reports.cfm

1. Guidelines For The Conversion Of Urban Four Lane Undivided Roadways To Three-lane Two-way Left Turn Lane Facilities – *April 2001; Dr. Keith Knapp and Karen Giesse*
2. Converting Four Lane Undivided Roadways to a Three Lane Cross Section: Factors to consider
   – *1999; Dr. Keith Knapp, Tom Welch, and John Witmer*
3. The Conversion of Four Lane Undivided Urban Roadways to Three-Lane facilities
   – *999; Tom Welch*

TRANSPORTATION Revolution 5 Mississippi Valley Conference

Iowa Older Driver Accommodation

Engineering Solutions Are Needed!

Paved Shoulder Rumble Strips

New Iowa DOT Policy

4’ Shoulder With

Rumble Strip

Review Pavement Marking and Reflectivity Standards

Larger Rural Street Signs

More Turn Lanes

Offset Turn Lanes

Expressway Study

TRANSPORTATION RevOlutiOn 5 Mississippi Valley Conference

4-Lane to 3-Lane Conversions

Troy A. Jerman, P.E.
Senior Transportation Engineer
Office of Traffic and Safety
Highway Division
Iowa Department of Transportation
800 Lincoln Way
Ames, Iowa 50010
515 239-1470
troy.jerman@dot.iowa.gov